


MOTOROLA
**MCM6670
MCM6674**
128c X 7 X 5 CHARACTER GENERATOR

The MCM6670 is a mask-programmable horizontal-scan (row select) character generator containing 128 characters in a 5 X 7 matrix. A 7-bit address code is used to select one of the 128 available characters, and a 3-bit row select code chooses the appropriate row to appear at the outputs. The rows are sequentially displayed, providing a 7-word sequence of 5 parallel bits per word for each character selected by the address inputs.

The MCM6674 is a preprogrammed version of the MCM6670. The complete pattern of this device is contained in this data sheet.

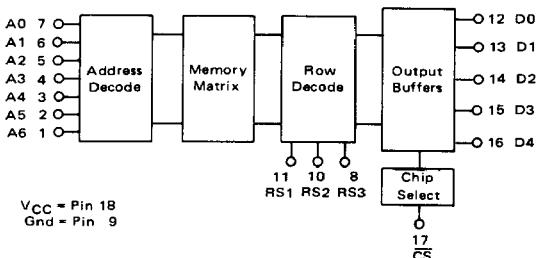
- Fully Static Operation
- TTL Compatibility
- Single $\pm 10\%$ +5 Volt Power Supply
- 18-Pin Package
- Diagonal Corner Power Supply Pins
- Fast Access Time, 350 ns (max)

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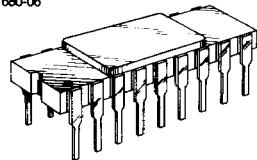
ABSOLUTE MAXIMUM RATINGS (See Note 1)

Rating	Symbol	Value	Unit
Supply Voltage	V _{CC}	-0.3 to +7.0	Vdc
Input Voltage	V _{in}	-0.3 to +7.0	Vdc
Operating Temperature Range	T _A	0 to +70	°C
Storage Temperature Range	T _{stg}	-65 to +150	°C

NOTE 1: Permanent device damage may occur if ABSOLUTE MAXIMUM RATINGS are exceeded. Functional operation should be restricted to RECOMMENDED OPERATING CONDITIONS. Exposure to higher than recommended voltages for extended periods of time could affect device reliability.

BLOCK DIAGRAM

**MCM6670
MCM6674**
MOS

(IN-CHANNEL, SILICON GATE)

**128c x 7 x 5
HORIZONTAL-SCAN
CHARACTER GENERATOR**
**L SUFFIX
CERAMIC PACKAGE
CASE 680-06**

**P SUFFIX
PLASTIC PACKAGE
CASE 707-02**
PIN ASSIGNMENT

A6	1	18	V _{CC}
A5	2	17	CS
A4	3	16	D4
A3	4	15	D3
A2	5	14	D2
A1	6	13	D1
A0	7	12	D0
RS1	8	11	RS1
GND	9	10	RS2

This device contains circuitry to protect the inputs against damage due to high static voltages or electric fields; however, it is advised that normal precautions be taken to avoid application of any voltage higher than maximum rated voltages to this high impedance circuit.

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MCM6670•MCM6674**DC OPERATING CONDITIONS AND CHARACTERISTICS**
(Full operating voltage and temperature range unless otherwise noted.)**RECOMMENDED DC OPERATING CONDITIONS**

Parameter	Symbol	Min	Nom	Max	Unit
Supply Voltage	V _{CC}	4.5	5.0	5.5	Vdc
Input High Voltage	V _{IH}	2.0	—	5.5	Vdc
Input Low Voltage	V _{IL}	-0.3	—	0.8	Vdc

DC CHARACTERISTICS

Characteristic	Symbol	Min	Typ	Max	Unit
Input Current (V _{in} = 0 to 5.5 V)	I _{in}	—	—	2.5	μAdc
Output High Voltage (I _{OH} = -205 μA)	V _{OH}	2.4	—	V _{CC}	Vdc
Output Low Voltage (I _{OL} = 1.6 mA)	V _{OL}	—	—	0.4	Vdc
Output Leakage Current (Three-State) (CS = 2.0 V or CS = 0.8 V, V _{out} = 0.4 V to 2.4 V)	I _{LO}	—	—	10	μAdc
Supply Current (V _{CC} = 5.5 V, T _A = 0°C)	I _{CC}	—	--	130	mAdc

CAPACITANCE (T_A = 25°C, f = 1.0 MHz)

Characteristic	Symbol	Typ	Unit
Input Capacitance	C _{in}	5.0	pF
Output Capacitance	C _{out}	5.0	pF

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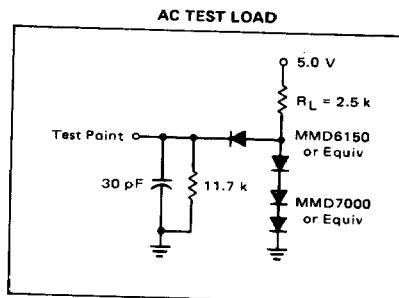
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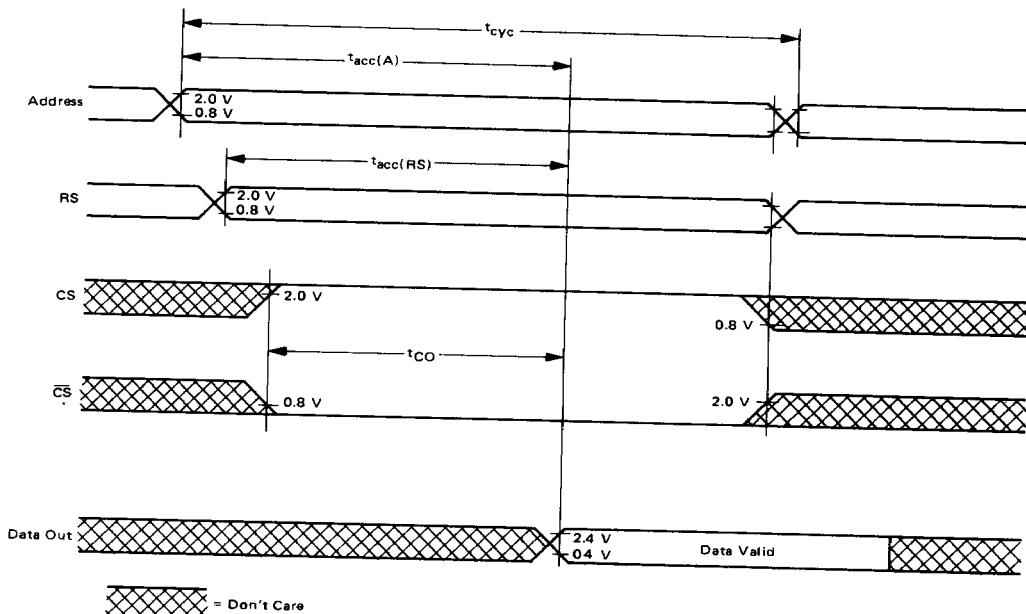
AC OPERATING CONDITIONS AND CHARACTERISTICS
 (Full operating voltage and temperature range unless otherwise noted.)

AC TEST CONDITIONS

Condition	Value
Input Pulse Levels	0.8 V to 2.0 V
Input Rise and Fall Times	20 ns
Output Load	1 TTL Gate and $C_L = 30 \text{ pF}$

**AC CHARACTERISTICS**

Characteristic	Symbol	Min	Max	Unit
Cycle Time	t_{cyc}	350	—	ns
Address Access Time	$t_{acc(A)}$	—	350	ns
Row Select Access Time	$t_{acc(RS)}$	—	350	ns
Chip Select to Output Delay	t_{CO}	—	150	ns

TIMING DIAGRAM

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CUSTOM PROGRAMMING FOR MCM6670

By the programming of a single photomask, the customer may specify the content of the MCM6670. Encoding of the photomask is done with the aid of a computer to provide quick, efficient implementation of the custom bit pattern while reducing the cost of implementation.

Information for the custom memory content may be sent to Motorola in the following forms, in order of preference:

1. Hexadecimal coding using IBM Punch Cards (Figures 3 and 4).
2. Hexadecimal coding using ASCII Paper Tape Punch (Figure 5).

Programming of the MCM6670 can be achieved by using the following sequence:

1. Create the 128 characters in a 5 x 7 font using the format shown in Figure 1. Note that information at output D4 appears in column one, D3 in column two, thru D0 information in column five. The dots filled in and programmed as a logic "1" will appear at the outputs

as V_{OH}; the dots left blank will be at V_{OL}. R0 is always programmed to be blank (V_{OL}). (Blank formats appear at the end of this data sheet for your convenience; they are not to be submitted to Motorola, however.)

2. Convert the characters to hexadecimal coding treating dots as ones and blanks as zeros, and enter this information in the blocks to the right of the character font format. The information for D4 must be a hex one or zero, and is entered in the left block. The information for D3 thru D0 is entered in the right block, with D3 the most significant bit for the hex coding, and D0 the least significant.

3. Transfer the hexadecimal figures either to punched cards (Figure 3) or to paper tape (Figure 5).

4. Transmit this data to Motorola, along with the customer name, customer part number and revision, and an indication that the source device is the MCM6670.

5. Information should be submitted on an organizational data form such as that shown in Figure 2.

FIGURE 1 – CHARACTER FORMAT

ROW SELECT TRUTH TABLE			
RS3	RS2	RS1	OUTPUT
0	0	0	R0
0	0	1	R1
0	1	0	R2
0	1	1	R3
1	0	0	R4
1	0	1	R5
1	1	0	R6
1	1	1	R7

Character Number (CUSTOMER INPUT)			Character Number (CUSTOMER INPUT)		
MSB	LSB	HEX	MSB	LSB	HEX
R0	0 0	0 0	R0	0 0	0 0
R1	0 4	0 4	R1	1 F	1 F
R2	0 A	0 A	R2	1 0	1 0
R3	1 1	1 1	R3	1 0	1 0
R4	1 1	1 1	R4	1 C	1 C
R5	1 F	1 F	R5	1 0	1 0
R6	1 F	1 F	R6	1 0	1 0
R7	1 1	1 1	R7	1 F	1 F
D4 D3	D0		D4 D3	D0	

FIGURE 2 – FORMAT FOR PROGRAMMING GENERAL OPTIONS

ORGANIZATIONAL DATA MCM6670 MOS READ ONLY MEMORY					
Customer:					
Company: _____					
Part No.: _____					
Originator: _____					
Phone No.: _____					
Chip-Select Options:		Active High 1	Active Low 0	No-Connect	
CS		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Motorola Use Only:					
Quote: _____					
Part No.: _____					
Specif. No.: _____					

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FIGURE 3 – CARD PUNCH FORMAT

Columns	
1-9	Blank
10-25	Hex coding for first character
26	Slash (/)
27-42	Hex coding for second character
43	Slash (/)
44-59	Hex coding for third character
60	Slash (/)
61-76	Hex coding for fourth character
77-78	Blank
79-80	Card number (starting 01; thru 32)

Column 10 on the first card contains either a zero or a one to program D4 of row R0 for the first character. Column 11 contains the hex character for D3 thru D0. Columns 12 and 13 contain the information to program R1. The entire first character is coded in columns 10 thru 25. Each card contains the coding for four characters; 32 cards are required to program the entire 128 characters. The characters must be programmed in sequence from the first character to the last in order to establish proper addressing for the part. Figure 3 provides an illustration of the correct format.

FIGURE 4 – EXAMPLE OF CARD PUNCH FORMAT

(First 12 Characters of MCM6670P4)

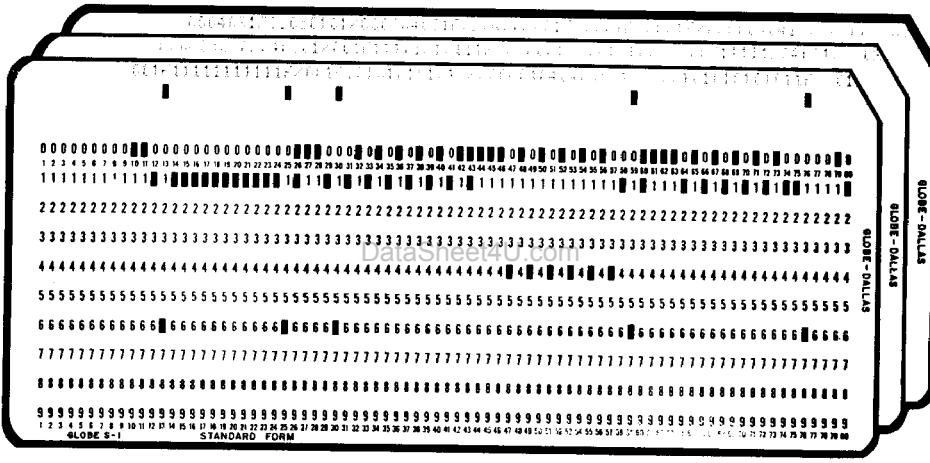


FIGURE 5 – PAPER TAPE FORMAT

Frames	
Leader	Blank Tape
1 to M	Allowed for customer use ($M \leq 64$)
$M + 1, M + 2$	CR; LF (Carriage Return; Line Feed)
$M + 3$ to $M + 66$	First line of pattern information (64 hex figures per line)
$M + 67, M + 68$	CR; LF
$M + 69$ to $M + 2114$	Remaining 31 lines of hex figures, each line followed by a Carriage Re- turn and Line Feed
Blank Tape	

Blank Tape
Frames 1 to M are left to the customer for internal identification, where $M \leq 64$. Any combination of alpha-numerics may be used. This information is terminated with a Carriage Return and Line Feed, delineating the

start of data entry. (Note that the tape cannot begin with a CR and/or LF, or the customer identification will be assumed to be programming data.)

Frame M + 3 contains a zero or a one to program D4 of row R0 for the first character. Frame M + 4 contains the hex character for D3 thru D0, completing the programming information for R0. Frames M + 5 and M + 6 contain the information to program R1. The entire first character is coded in Frames M + 3 thru M + 18. Four complete characters are programmed with each line. A total of 32 lines program all 128 characters (32×4). The characters must be programmed in sequence from the first character to the last in order to establish proper addressing for the part.

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The formats below are given for your convenience in preparing character information for MCM6670 programming. THESE FORMATS ARE NOT TO BE USED TO TRANSMIT THE INFORMATION TO MOTOROLA. Refer to the Custom Programming instructions for detailed procedures.

Character Number _____

	MSB	LSB	HEX
R0	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R1	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R2	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R3	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R4	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R5	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R6	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R7	<input type="checkbox"/>	<input type="checkbox"/>	0 0
D4 D3	<input type="checkbox"/>	<input type="checkbox"/>	0 0

Character Number _____

	MSB	LSB	HEX
R0	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R1	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R2	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R3	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R4	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R5	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R6	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R7	<input type="checkbox"/>	<input type="checkbox"/>	0 0
D4 D3	<input type="checkbox"/>	<input type="checkbox"/>	0 0

Character Number _____

	MSB	LSB	HEX
R0	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R1	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R2	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R3	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R4	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R5	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R6	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R7	<input type="checkbox"/>	<input type="checkbox"/>	0 0
D4 D3	<input type="checkbox"/>	<input type="checkbox"/>	0 0

Character Number _____

	MSB	LSB	HEX
R0	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R1	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R2	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R3	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R4	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R5	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R6	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R7	<input type="checkbox"/>	<input type="checkbox"/>	0 0
D4 D3	<input type="checkbox"/>	<input type="checkbox"/>	0 0

Character Number _____

	MSB	LSB	HEX
R0	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R1	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R2	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R3	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R4	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R5	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R6	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R7	<input type="checkbox"/>	<input type="checkbox"/>	0 0
D4 D3	<input type="checkbox"/>	<input type="checkbox"/>	0 0

Character Number _____

	MSB	LSB	HEX
R0	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R1	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R2	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R3	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R4	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R5	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R6	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R7	<input type="checkbox"/>	<input type="checkbox"/>	0 0
D4 D3	<input type="checkbox"/>	<input type="checkbox"/>	0 0

Character Number _____

	MSB	LSB	HEX
R0	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R1	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R2	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R3	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R4	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R5	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R6	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R7	<input type="checkbox"/>	<input type="checkbox"/>	0 0
D4 D3	<input type="checkbox"/>	<input type="checkbox"/>	0 0

Character Number _____

	MSB	LSB	HEX
R0	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R1	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R2	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R3	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R4	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R5	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R6	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R7	<input type="checkbox"/>	<input type="checkbox"/>	0 0
D4 D3	<input type="checkbox"/>	<input type="checkbox"/>	0 0

Character Number _____

	MSB	LSB	HEX
R0	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R1	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R2	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R3	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R4	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R5	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R6	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R7	<input type="checkbox"/>	<input type="checkbox"/>	0 0
D4 D3	<input type="checkbox"/>	<input type="checkbox"/>	0 0

Character Number _____

	MSB	LSB	HEX
R0	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R1	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R2	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R3	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R4	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R5	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R6	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R7	<input type="checkbox"/>	<input type="checkbox"/>	0 0
D4 D3	<input type="checkbox"/>	<input type="checkbox"/>	0 0

Character Number _____

	MSB	LSB	HEX
R0	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R1	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R2	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R3	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R4	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R5	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R6	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R7	<input type="checkbox"/>	<input type="checkbox"/>	0 0
D4 D3	<input type="checkbox"/>	<input type="checkbox"/>	0 0

Character Number _____

	MSB	LSB	HEX
R0	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R1	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R2	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R3	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R4	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R5	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R6	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R7	<input type="checkbox"/>	<input type="checkbox"/>	0 0
D4 D3	<input type="checkbox"/>	<input type="checkbox"/>	0 0

Character Number _____

	MSB	LSB	HEX
R0	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R1	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R2	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R3	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R4	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R5	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R6	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R7	<input type="checkbox"/>	<input type="checkbox"/>	0 0
D4 D3	<input type="checkbox"/>	<input type="checkbox"/>	0 0

Character Number _____

	MSB	LSB	HEX
R0	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R1	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R2	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R3	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R4	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R5	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R6	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R7	<input type="checkbox"/>	<input type="checkbox"/>	0 0
D4 D3	<input type="checkbox"/>	<input type="checkbox"/>	0 0

Character Number _____

	MSB	LSB	HEX
R0	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R1	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R2	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R3	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R4	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R5	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R6	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R7	<input type="checkbox"/>	<input type="checkbox"/>	0 0
D4 D3	<input type="checkbox"/>	<input type="checkbox"/>	0 0

Character Number _____

	MSB	LSB	HEX
R0	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R1	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R2	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R3	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R4	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R5	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R6	<input type="checkbox"/>	<input type="checkbox"/>	0 0
R7	<input type="checkbox"/>	<input type="checkbox"/>	0 0
D4 D3	<input type="checkbox"/>	<input type="checkbox"/>	0 0

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FIGURE 6 – MCM6674 PATTERN

FROM